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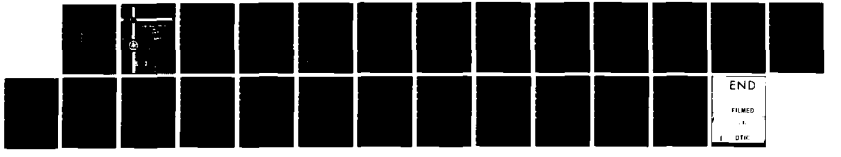

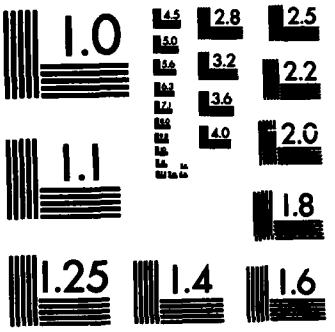

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USAFETAC/TN-82/006

ATMOSPHERIC TRANSPORT AND DISPERSION MODEL

USER'S MANUAL

Robert Cox, 1Lt, USAF

OCTOBER 1982

UNITED STATES AIR FORCE
AIR WEATHER SERVICE (MAC)
USAF
ENVIRONMENTAL
TECHNICAL APPLICATIONS
CENTER
SCOTT AIR FORCE BASE, ILLINOIS 62225

REVIEW AND APPROVAL STATEMENT

USAFETAC/TN-82/006, Atmospheric Transport and Dispersion Model: User's Manual, October 1982, is approved for public release. There is no objection to unlimited distribution of this document to the public at large, or by the Defense Technical Information Center (DTIC) to the National Technical Information Service (NTIS).

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FOR THE COMMANDER

DR. PATRICK J. BREITLING

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Trajectory	Transport Layer Depth
Vertical Wind Shear	Potential Temperature

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Atmospheric Transport and Dispersion Model (ATAD) is oriented toward transport and dispersion studies. It can calculate trajectories of 5-days duration either forward or backward in time at 6-hour intervals during any selected period for any number of requested locations. The individual trajectories are calculated using transport winds averaged in a vertical layer. There are various optional and standard output characteristics. They include tables of transport layer depth, maximum vertical wind shear, trajectory positions, trajectory plots, and surface air concentrations. This program was (Cont'd)

20. ABSTRACT (Cont'd): developed for an IBM 4341 computer using the OS operating system.

CONTENTS

ILLUSTRATIONS

TABLES

SECTION 1.0 GENERAL

1.1 Purpose of the User's Manual. This user's manual for the atmospheric transport and dispersion model (ATAD) provides the information necessary to use the ATAD program effectively.

1.2 Project References.

1.2.1 Project Request. A project request was sent to USAF Environmental Technical Applications Center (USAFETAC) on 7 April 1982 describing the work required in accordance with AWSR 105-18. This request was in support of Air Force Wright Aeronautical Laboratories (AFWAL). The USAFETAC project number assigned to this project was 2863, with tasks 01 and 02.

1.2.2 Documentation Concerning the Project. NOAA Technical Memorandum ERL ARL-81, "Air Resources Laboratories Atmospheric Transport and Dispersion Model," by Jerome L. Heffter, contains a description of the equations used in the program and outlines the theory involved. A copy of the program and a sample data base is archived in the USAFETAC Tape Library. The tape number is 380 and it is on indefinite hold.

1.2.3 Documentation Standards and Specifications. At this time the documentation meets the standards specified by NOAA. The program has been modified to comply with the documentation standards outlined in USAFETAC Regulation 300-2, dated 26 January 1982.

1.2.4 Programming Conventions. American National Standards Institute (ANSI) FORTRAN programming conventions have been adhered to, except in FORMAT statements, literals are written inside apostrophes instead of using the Hollerith format code.

1.3 Terms and Abbreviations.

AFR	Air Force Regulation
AFWAL	Air Force Wright Aeronautical Laboratories
ARL	Air Resources Laboratories
ATAD	Atmospheric Transport and Dispersion Model
AWS	Air Weather Service
CMS	Conversational Monitoring System
CPU	Central Processing Unit
IBM	International Business Machines
MSL	Mean Sea Level
NOAA	National Oceanic and Atmospheric Administration
SID	Station Identification
TLD	Transport Layer Depth
TLH	Transport Layer Height
USAFETAC	United States Air Force Environmental Technical Applications Center

1.4 Security and Privacy. This manual and the program that it describes are unclassified. The manual can be released to the public, but not the program. Please note that provisions of AFR 300-6, paragraph 11-7 must be met before the ATAD Program can be released to non-USAF agencies.

SECTION 2.0 SYSTEM SUMMARY

2.1 System Applications. The ATAD program provides the user with information concerning pollution problems oriented toward practical applications for both long and short-term studies. The user can obtain trajectories of 5-days duration from any number of origins, starting every 6 hours during any selected period (i.e., day, month, or season). The program may run either forward or backward in time. Trajectories are calculated using transport wind averaged in a vertical layer. Diffusion and deposition calculations are made for the forward trajectories.

2.2 System Operation. Users must supply the program with the number of origins, origin ID, start date, number of days to be run, direction in time, transport layer base and top, map boundaries, trajectory day, trajectory start hour, and time, in hours, after start of trajectory. For a further description check Table 2. The output includes:

a. A listing of selected input parameter values.

b. A listing of dates from the input.

c. For each trajectory, a table of transport layer depth.

d. For each trajectory, a table of maximum vertical wind shear.

e. A table of the trajectory portion at 6-hour intervals.

f. The ability to plot trajectories on any desired map scales.

g. Maps of time-averaged surface air concentrations.

The overall functional diagram is shown schematically in Figure 1.

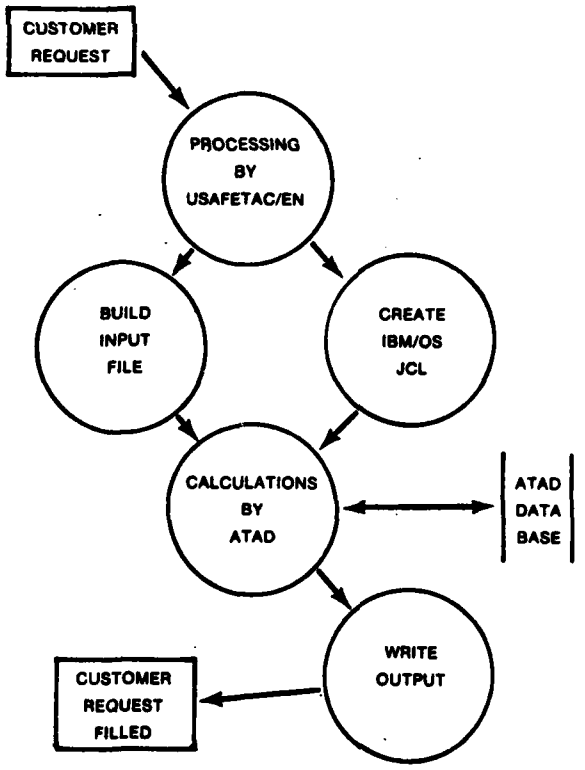


Figure 1. The Overall Functional Diagram.

2.3 Program Configurations. The Atmospheric Transport and Dispersion Model was designed for an IBM 4341 computer using the OS operating system.

2.4 Program Organization. The program consists of a main program and 18 subroutines. The main program solicits and controls all input data. The numerical calculations are performed by the various subroutines. The output is written directly to the system printer. The calling structure of the main program and subprograms is illustrated in Figure 2. The purpose of each subprogram is outlined in Table 1.

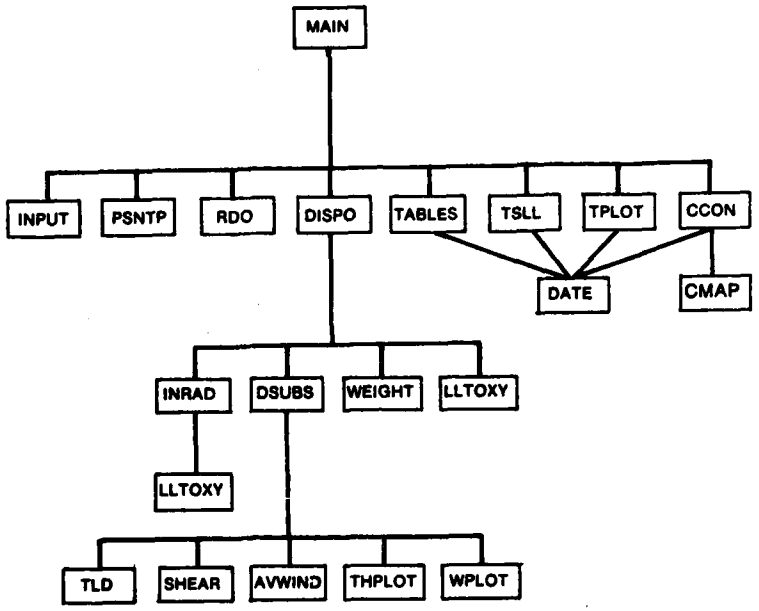


Figure 2. Calling Structure.

2.5 Performance.

2.5.1 Overall Performance Capabilities. The ATAD program is oriented toward transport and dispersion studies. It can calculate trajectories of 5-days duration forward in time at 6-hour intervals during any selected period for any number of requested locations. The individual trajectories are calculated using transport winds averaged in a vertical layer. If the user requests a forward trajectory the dispersion can be calculated. There are various optional and standard output characteristics that will be discussed later. They include tables of transport layer depth (TLD), maximum vertical wind shear in the transport layer, trajectory positions, trajectory plots, and time averaged surface air concentrations.

2.5.2 Response and Processing Time. The response time of this program depends on the processing time required by the user options (e.g., forward vs backward, transport layer base and top, trajectory maps, etc). For example, one requested location for 1 month using all the user options can be run on an IBM 4341 in about 1.5 to 2 minutes. Each additional requested location adds about 20 seconds to the run.

2.5.3 Input/Output Limitations. If the user-supplied input data is not in the format as described in Table 2 (in Section 3.2.1) the program will abort. As mentioned earlier, there are standard and optional characteristics in ATAD. Section 3.3.2 gives a detailed description of the standard and optional output data for ATAD.

2.5.4 Flexibility. The program is designed with standard and optional output listings. The optional output listings includes a vertical potential temperature

TABLE 1. Purpose of Subprograms.

SUBPROGRAM	PURPOSE
AVWIND	Calculates average winds in a layer.
CCON	Determines the average surface air concentration of a puff at various points in the sampling period.
CMAP	Maps the average surface air concentration of a puff.
DATE	Determines the date for the printout. DATE has one other entry point; NWMOYR.
DISPO	Gives trajectory segment displacement using the observed data.
DSUBS	Sets the transport layer base.
INRAD	When displacement calculations are made, this subroutine tests for wind data within a 250 nautical mile radius of the requested point.
LLTOXY	Relates positions of points on the Earth (in latitude-longitude) to the positions on a polar stereographic projection. Positions on a polar stereographic projection are given Cartesian coordinates in a coordinate system with the origin and length units selected by the user. LLTOXY has two other entry points; SCALER and XYTOLL.
PSNTP	Positions tape for starting the run at the designated beginning time.
RDO	Reads observed input data and calculates the potential temperature.
SHEAR	Determines the amount of shear in the transport layer. Also, calculates the thermal wind for each wind layer in the transport layer.
TABLES	The average transport layer depth and shear are printed in tabular form.
THPLOT	Creates optional output sheet of vertical potential temperature profiles for individual rawinsonde stations.
TLD	Determines the transport layer depth from a vertical temperature profile.
TPLOT	Creates the optional output of the individual trajectory plots for the requested station for the requested time.
TSLL	The latitude and longitude of a trajectory segment are printed in tabular form.
WEIGHT	Computes the weight given to a station to be used in a calculation.
WPLOT	Prints the optional wind table as a function of height and the wind hodograph.

profile for individual rawinsonde stations and a vertical wind component structure and wind hodograph for those stations. Also, there is an optional output for individual trajectory plots and average surface air concentration. The output consists of the descriptive run parameters, meteorological data identification, a listing of transport layer depth values, a listing of maximum vertical wind shear values, and a listing of the latitude and longitude of trajectory positions (Figures 3 to 10).

INPUT DATA

ORIGIN**********DTN (39.80 84.20)
START DATE**********27 Jul 75
NUMER OF DAYS********** 1
DIRECTION IN TIME**********FORW
TRAJECTORY DURATION IN DAYS***** 5

MAP BOUNDARIES
TOP AND BOTTOM BOUNDARIES******* 45. 35.
LEFT AND RIGHT LONGITUDES******* 88. 70.

FIGURE 3. Standard ATAD Output of Discriptive Run Parameters.

INPUT METEOROLOGY

	TIME PERIOD	TYPE
FROM	1975 JUL 27- 0Z	WIND
FROM	1975 JUL 27- 0Z	TEMP
TO	1975 AUG 2- 0Z	WIND
TO	1975 AUG 2- 0Z	TEMP

MAXIMUM NUMBER OF STATIONS 17

FIGURE 4. Standard ATAD Output of Meteorological Data Identification.

2.6 Data Base. A data base called NAMER-WINDTEMP has been created by NOAA for their version of ATAD. This is the data base USAFETAC uses also. A further description is provided in Appendix A.

2.7 General Description of Inputs, Processing, and Outputs.

2.7.1 Inputs. All input to the program can be typed on a terminal. The user can use cards if he/she desires. The user should follow Table 2 for the desired format. Each entry, 1 through 9.3, should be on a separate line if a CMS terminal is used, or separate card if cards are used. Also, each entry should begin in column 1. Zeros, 0, are important. If an item is not desired, leave a blank space/card. For example, entry 6 is for the transport layer base and top, if the user desires ATAD to determine this then leave a blank space/card. For an example of the input procedure check Section 3.2.3.

2.7.2 Processing. The user begins by setting up his run file, the input data. The program will then run to completion without any user interfacing. The printing of the output takes place immediately after processing. If there are multiple requests the user will set up his run file appropriately.

2.7.3 Output. All output is sent to the system printer. The format, type, and contents of the output will vary depending upon the user's need. The types and formats of output are described in detail in Section 3.3.

SECTION 3.0 STAFF FUNCTIONS RELATED TO TECHNICAL OPERATIONS

3.1 Initiation Procedures. The user first logs on to the IBM CMS terminal. Next, the user creates the appropriate run file. At this point the proper IBM JCL is typed. When finished, the job is transferred to the OS operating system and completed; this step is transparent to the user. An example of this procedure is found in Appendix B. (Note: To use punch cards just submit an OS job deck with the appropriate data cards.)

3.2 Staff Input Requirements. The user inputs the data to this program via an IBM CMS terminal or punch cards. Check Section 3.2.1 for the complete requirements and the format for the input data.

3.2.1 Input Contents and Formats. ATAD requires certain user supplied input information for each operational run. This input information is described fully in Table 2.

TABLE 2. User Supplied Input Information.

1. Number of Origins (NN)

```
NN
01
```

This means the computer will make one run for one origin (the leading 0 must be present for proper alignment under the designated code.) Additional files must be allocated for more than one origin. The program requires located files for units 20+1, 20+2, ..., 20+NN. The maximum number of origins is 10.

2. Origin ID (STN) Latitude (LL.LL) Longitude (LLL.LL)

```
STN LL.LL LLL.LL
DTN 39.80 084.20
```

This designates a trajectory for Dayton, Ohio, latitude 39.80°N, longitude 84.20°W. There must be equal number of Origin ID's for the number of origins specified in Item 1. Each origin is entered on a separate line.

3. Start Day (DD) Month (MMM) Year (YY)

```
DD MMM YY
27 JUL 75
```

4. Number of Days to be Run (NN)

```
NN
01
```

There are four trajectories per day that will be run. Note if complete 5-day backward trajectories are needed for the 1-day period, the start day in item 3 should be 5 days earlier. The number of days to be run should be 5+1 or 6 days. The maximum number of days that can be run is 31.

5. Forward (FORW) or Backward (BACK) in time

```
XXXX
FORW
```

Note that trajectories are to be run forward in time.

6. Transport layer Base (BBBB) and Top (TTTT) in meters above ground level.

BBBB TTTT
Blank Card

The user may specify this or leave a blank card. The blank card designates the transport layer to be determined by model calculations.

7. Map Boundaries: Top Latitude (TT), Bottom Latitude (BB), Left Longitude (LLL), Right Longitude (RRR)

TT BB LLL RRR
45 35 088 070

The data within this area are extracted from the NAMER-WINDTEMP Data tapes and are used in model calculations. It is suggested that (LLL-RRR) ≅ 1.7 (TT-BB) for a reasonable computer map display outlined in Item 9 below.

8. To Print Vertical Temperature and Wind Profiles for a Trajectory Position.

Day (DD) Start hour (ZZ, 00 06 12 18) Time after start (TT)

DD ZZ TT
27 00 12

A blank card is used here for no profiles.

9. Trajectory Maps (T) and Concentration and Deposition Maps (C)

T C
1 1

The code 1 means the user wants a map and code 0 means the user does not want a map.

If dispersion calculations are needed, three additional input parameters are required. If dispersion calculations are not required, blank cards/lines must be inserted in place of the information below.

9.1 Average Source Term in Curies (ci) Per Hour (QQQ)

QQQ
001

An average of 1 ci/hr

9.2 Sampling Period Duration in Hours (DDD)

DDD
024

9.3 Number of Sampling Periods (NNN)

NNN
001

One sampling period of 24 hours is designated.

Other meteorological input data are required. This data is supplied via an input tape. The format is described below. Global upper-air observed data collected by the USAF are sorted by synoptic time and stored on magnetic tape (2 tapes = 1 month of data). A data extraction is done for specific geographical areas of interest. The data base contains upper-air winds, temperature, and heights from rawinsonde and pibal stations for North America (excluding Alaska) from the surface to 500 mb. One year of data is stored on two to three magnetic tapes. See Appendix A for a description of the NAMER-WINDTEMP data magnetic tape.

3.2.2 Composition Rules. The programming language used is FORTRAN. Certain limitations are imposed on the composition of the input. If one follows the description given in Table 2, then no problems should arise.

3.2.3 Sample Inputs. At the present time there is a file called ATAD JCL that contains the input for the operations of the program. If for some reason this file is destroyed here is an example of how to recreate it using the IBM XEDIT editor.

```
//DNDATAD     Job   (286301,DND,10,2),COX,TYPRUN=HOLD
//ATAD        EXEC FTGILG
//LKED.SYSIN  DD *
//GO.FT10F001 DD  DSN=DNDTAPE,
//            DISP=OLD,
//            UNIT=TAPE,
//            LABEL=(1,BLP),
//            VOL=SER=WDTMP2,
//            DCB=(RECFM=F,LRELL=80,BLKSIZE=80)
//GO.SYSIN    DD *
01
DTN 39.80 084.20
27 Jul 75
01
FORW
BLANK CARD
45 35 088 070
27 00 12
1 1
001
024
001
/*
```

The "DSN=" is a dummy statement and can contain any series of characters up to 17. The 'VOL=SER=' is the command to the computer identifying your data set. Six (6) characters are allowed. Once this is created, advance to the third line, //LKED.SYSIN DD*, and type GET ATAD TEXT. This gives everything needed to run the program. If a copy of ATAD JCL already exists and only the run parameters need to be changed, this file, ATAD JCL, should be updated using the XEDIT editor. The run parameters are located after the second SYSIN statement and are fully described in Section 3.2.1. Once the user is satisfied with ATAD JCL, it should be run using the IBM OS operating system. This is accomplished by typing VS1 ATAD. Then submit a blue USAFETAC Form 0-19 indicating that there is a job in the IBM OS queue. The data tape number is to be written on the 0-19. A few minutes after the data tape has been mounted the results will be printed on the system printer.

3.3 Output Requirements. All output goes to the system printer. The output varies depending on the output needed. The output will be described in detail below.

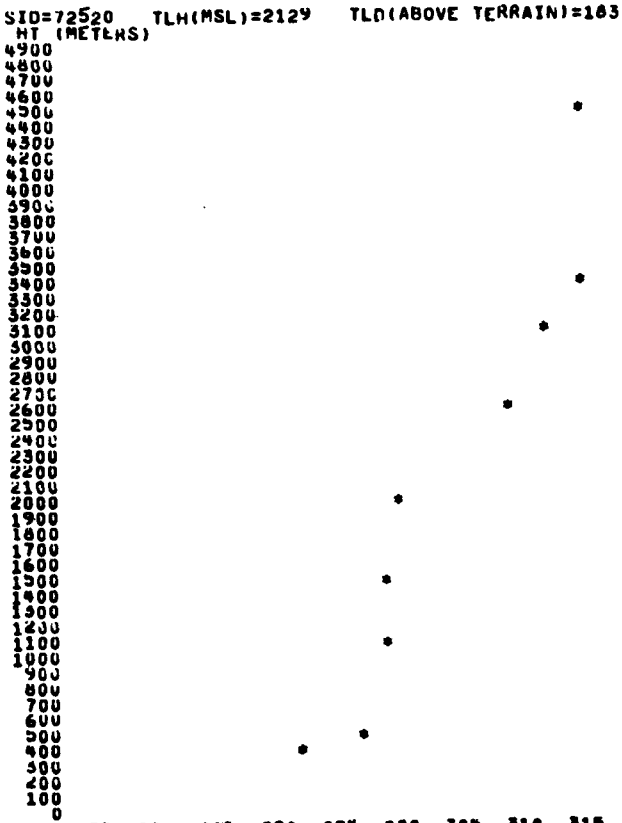
3.3.1 Output Formats. The format of the output varies according to the option being used. The different format options are described below.

a. An option is provided to output vertical potential temperature profiles. Also, this option lists observed wind components as a function of height and includes a wind hodograph (Figure 5).

b. A plot of the calculated trajectories can be received using a Mercator map projection. The scale is selected by the user. Four trajectories, one per day, are plotted with a code of the plotted symbols to identify each computer run (Figure 6).

c. Standard output includes a list of transport layer depth (TLD) values along each trajectory for successive 3-hour segments. If a constant TLD is specified by the user, then this part of the output will be omitted. But, the base and top of the constant layer will appear in the listing of parameters in each individual run (Figure 8).

a)



b)

HT COUED	HT M	XW M/S	YW M/S
N	5820	11.6	-5.4
M	5486	12.6	-5.9
L	4877	14.0	-5.1
K	4267	11.1	-2.0
J	3962	8.7	0.0
I	3658	8.7	0.0
H	3128	9.2	-0.8
G	2743	9.7	-0.8
F	2438	8.1	-1.4
E	2134	6.5	-1.7
D	1829	5.9	-1.6
C	1524	5.9	-1.6
B	1513	6.6	-1.2
A	1219	8.1	1.4
C	914	8.2	3.0
B	610	4.7	3.9
A	389	1.0	1.1

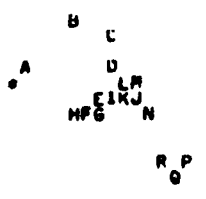


Figure 5. Optional ATAD Output of: a) Vertical Potential Temperature Profiles for Individual Rawinsonde Stations, and b) Vertical Wind Component Structure and Wind Hodograph. In this example the station identification (SID) is Pittsburgh, PA (72520). TLH refers to the transport layer height and TLD to the transport layer depth. XW and YW, respectively, are the east-west and north-south components. The asterisk on the hodograph is the station location and north is vertical.

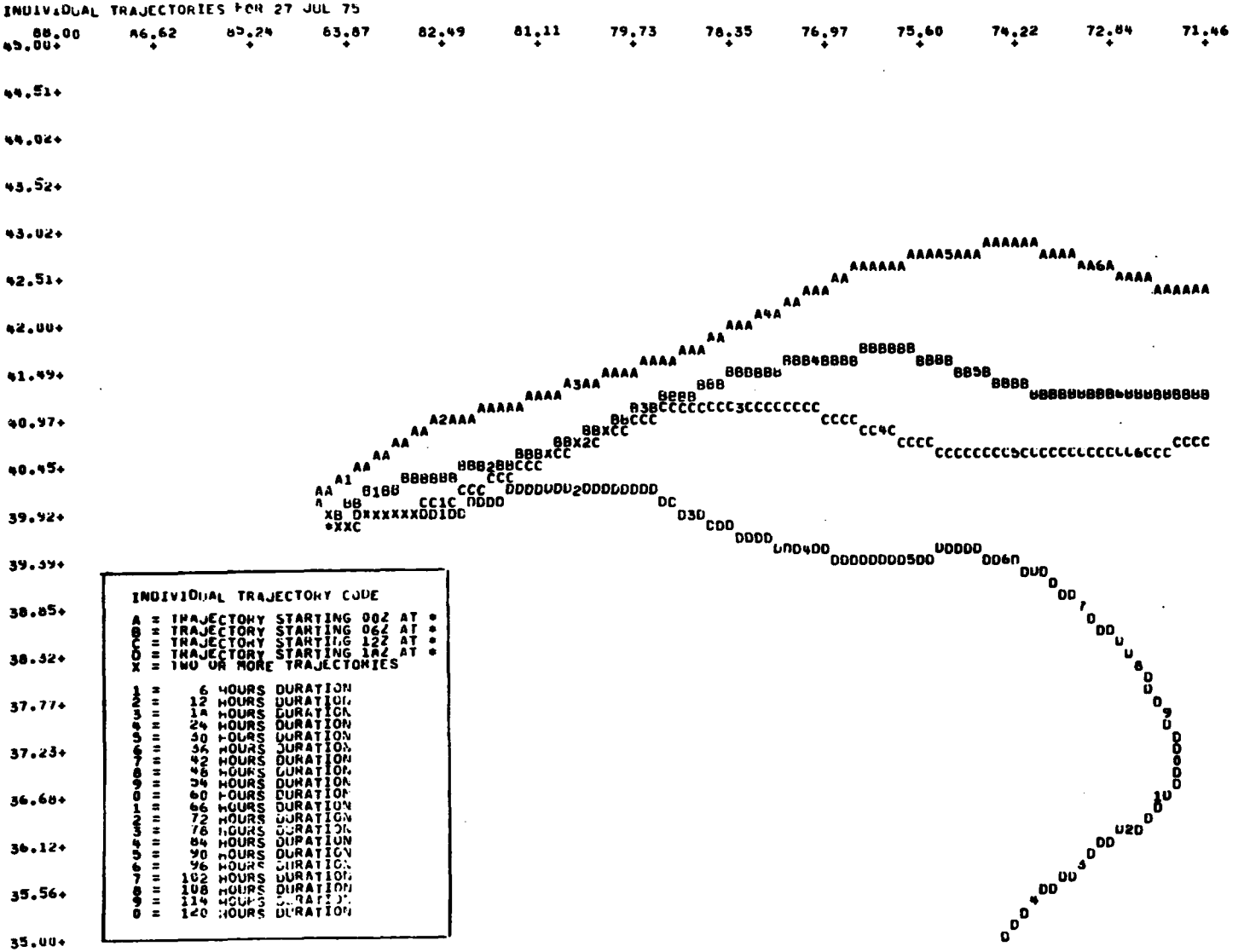


Figure 6. Optical ATAD Output of Individual Trajectory Plots.

LATITUDE AND LONGITUDE OF TRAJECTORY POSITIONS (DEGREES*100)

START DATE-TIME JUL 75	DURATION (HOURS) 6		12		18		24		30		36		42		48		54		60	
	66		72		78		84		90		96		102		108		114		120	
	LAT	LON	LAT	LON	LAT	LON	LAT	LON	LAT	LON	LAT	LON	LAT	LON	LAT	LON	LAT	LON	LAT	LON
27-0Z	4038	8385	4096	8255	4137	8054	4213	7780	4274	7524	4261	7295	4254	7102	4320	6897	4381	6642	9990	9990
	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990
27-6Z	4022	8346	4049	8176	4114	7955	4161	7705	4144	7479	4123	7276	4142	7080	4161	6866	9990	9990	9990	9990
	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990
27-12Z	4006	8252	4065	8042	4106	7821	4086	7613	4058	7418	4063	7242	4059	7067	4005	6907	9990	9990	9990	9990
	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990	9990
27-18Z	3993	8247	4018	8051	3988	7896	3948	7725	3943	7571	3938	7440	3884	7323	3817	7248	3759	7208	3705	7192
	3663	7209	3628	7259	3589	7327	3542	7390	3491	7446	3428	7495	3346	7529	9990	9990	9990	9990	9990	9990

Figure 7. Standard ATAD Output Listing the Latitude and Longitude of Trajectory Positions (trajectory termination indicated by 9990).

TRANSPORT LAYER DEPTH (HUNDREDS OF METERS ABOVE TERRAIN)

START DATE-TIME JUL 75	DURATION (HOURS) 3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120
27-0Z	2	4	5	5	16	18	19	26	24	18	14	7	6	18	17	28	28	29	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
27-6Z	2	4	15	17	17	16	21	21	19	16	13	27	24	28	28	25	25	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
27-12Z	16	16	17	16	16	20	20	21	20	28	29	26	25	24	24	21	23	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
27-18Z	16	21	18	17	17	20	25	28	27	25	23	16	16	12	13	13	13	18	18	19	20	22	23	19	19	16	17	17	18	18	18	20	20	21	22	99	99	99	99	99

Figure 8. Standard ATAD Output Listing Transport Layer Depth Values Along Each Trajectory (trajectory termination indicated by 99).

VERTICAL WIND SHEAR (PER SECOND * 100)

START DATE-TIME JUL 75	DURATION (HOURS) 3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120
27-0Z	0	0	0	0	1	1	1	2	2	1	1	1	1	1	1	1	1	1	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
27-6Z	0	0	1	1	1	2	2	1	1	1	1	1	1	2	1	1	1	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
27-12Z	1	1	1	1	2	1	1	1	1	1	1	2	2	1	1	1	1	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
27-18Z	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	99	99	99	99	99

FIGURE 9. Standard ATAD Output Listing Maximum Vertical Wind Shear Values Along Each Trajectory (trajectory termination indicated by 99).

d. Another standard output format is a listing of the maximum vertical wind shear in the transport layer for each segment. This enables the analyst to evaluate how accurately the computed average wind represents transport throughout the transport layer (Figure 9).

3.3.2 Description of Output Data. The following is a listing of standard and optional output data for ATAD. For an example of the items listed below refer to Appendix B.

a. INPUT DATA

This is standard output for ATAD. It includes the origin, start date, number of days, direction of the trajectory and its duration, and the map boundaries. The trajectory duration has been hardwired for 5 days. For a variable duration, one needs to change the first two dimension statements in the main program and change the statement NDYDUR to the appropriate number.

b. INPUT METEOROLOGY

TIME PERIOD TYPE

Once again this is standard input and includes the date/time of the trajectory in question. Also, it includes the time period type, which is read directly from the input tapes.

c. SID TLH TLD

Optional profiles of vertical potential temperatures are printed for the previously indicated trajectory and time period. SID is the station identification, TLH is the computed transport layer height in meters, and TLD is the transport layer depth in meters.

d. CODE HT XW YW

This is another optional output item that provides a wind profile with each optional temperature profile. HT is the height in meters above MSL of XW, the X-wind component, and YW, the Y-wind component. Also, a wind hodograph is plotted.

e. TRANSPORT LAYER DEPTH

(Hundreds of Meters above Terrain)

This is printed out as standard output. It is a table of the transport layer depth given when the layer is determined by the model. Ninety-nine (99) indicates the trajectory computation terminated due to the lack of sufficient meteorological data. When the user designates transport layer values, no table is printed.

f. VERTICAL WIND SHEAR

(Per Second * 100)

Standard output for the maximum vertical wind shear in the transport layer for successive 3-hour intervals. Once again 99 indicates trajectory termination.

g. LATITUDE AND LONGITUDE OF TRAJECTORY POSITIONS (DEGREES * 100)

Gives trajectory positions at 6-hour intervals. This is standard output. The code 9990 indicates trajectory termination.

h. INDIVIDUAL TRAJECTORY CODE AND PLOTS

An individual trajectory code precedes optional plots of four individual trajectories per day identified by date.

i. AVERAGE SOURCE TERM

j. MAP CODE

k. AVERAGE SURFACE AIR CONCENTRATION (CURIES/CUBIC METER) WITHOUT DEPOSITION

l. AVERAGE SURFACE AIR CONCENTRATION (CURIES/CUBIC METER) WITH DEPOSITION

m. DEPOSITION (CURIES/SQUARE METER)

Optional concentration and deposition plots identified by averaging dates.

3.3.3 Sample Output. Appendix B shows an example of program usage in which an analyst uses every possible option. Also, Figures 3 to 10 show examples of the sample output.

3.4 Utilization of System Outputs. The output produced by this program is used to answer typical requests from customers for atmospheric transport and dispersion problems.

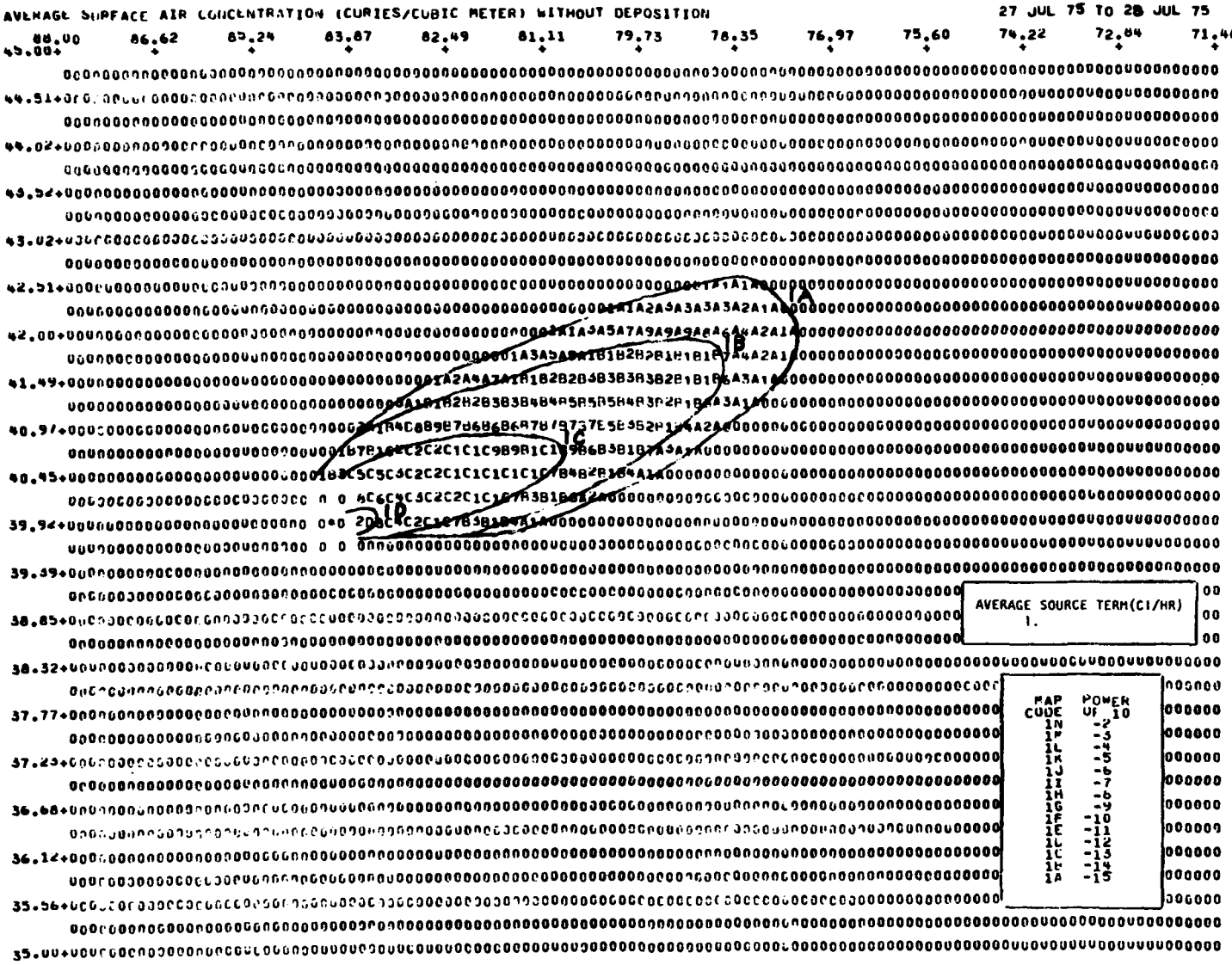


Figure 10. ATAD Output of Average Surface Air Concentration Coded Values. (The analysis is hand drawn.)

Appendix A

NAMER-WINDTEMP DATA MAGNETIC TAPE FORMAT

NAMER-WINDTEMP data tapes contain rawinsonde and pibal observations for North America (excluding Alaska) from the surface to 500 mb.

TAPE CHARACTERISTICS

TYPE	- 9 track, 1600 bpi, EBCDIC
LABEL	- None
RECORD FORMAT	- FB
RECORD LENGTH	- 30
BLOCK SIZE	- 12000

TAPE ORGANIZATION

All reporting stations, in block-station sequence, are compiled for each sequential observation time.

4 observation times per day (0, 6, 12, 18 GMT)
2 files per month (day 01 to 15; day 16 to last)
12 files per tape (6 months) (overlap onto another tape may occur at the end of a year).

DATA ORGANIZATION FOR EACH OBSERVATION TIME

TIME REC (FOR WINDS)

STA REC (STATION 1)
WIND REC (HEIGHT 1)
WIND REC (HEIGHT 2)
ETC.

STA REC (STATION 2)
WIND REC (HEIGHT 1)
WIND REC (HEIGHT 2)
ETC.

ETC.

TIME REC (FOR TEMPERATURES)

STA REC (STATION 1)
TEMP REC (HEIGHT 1)
TEMP REC (HEIGHT 2)
ETC.

STA REC (STATION 2)
TEMP REC (HEIGHT 1)
TEMP REC (HEIGHT 2)
ETC.

ETC.

DATA FORMAT

TIME REC:	MONTH (1ST 3 LETTERS)	YEAR	DAY	HOUR	NUMBER OF REPORTS	NUMBER OF RECORDS	MET FIELDS
	A3	I4	I2	I2	I4	I5	A1 W=WINDS T=TEMPS

STA REC:	BLOCK STATION	LATITUDE (DEG*100)	LONGITUDE (DEG*100)	STATION HGT (M,MSL)	AVG TERRAIN HGT (M,MSL)	NUMBER OF LEVELS
	I5	I5	I7	I5	I5	I2

WIND REC:	WIND HGT (M,MSL)	WIND DIRECTION (DEG)	WIND SPEED (M/S*10)
	I5	I3	I4

TEMP REC:	TEMPERATURE HGT (M,MSL)	PRESSURE (Mb*10)	TEMPERATURE (DEG K*10)
	I4	I5	I4

NAMER-WINDTEMP data tapes starting for the year 1975 (refer to TD-9743) are available at:

National Climatic Center, NOAA
Digital Products Section
Federal Building
Asheville NC 28801

They are also archieved in the USAFETAC tape library under the same title.

Appendix B

SAMPLE RUN FILE OF THE ATMOPSHERIC TRANSPORT AND DISPERSION MODEL

ATAD.JCL

```
//DNDATAD      Job   (286301,DND,10,2),COX,TYPRUN=HOLD
//ATAD         EXEC FTGILG
//LKED.SYSIN   DD *
//GO.FT10F001 DD  DSN=DNDTAPE,
//             DISP=OLD,
//             UNIT=TAPE,
//             LABEL=(1,BLP),
//             VOL=SER=WDTMP2,
//             DCB=(RECFM=F,LRECL=80,BLKSIZE=80)
//GO.SYSIN     DD *
01
DTN 39.80 084.20
27 Jul 75
01
FORW
BLANK CARD
45 35 088 070
27 00 12
1 1
001
024
001
/*
```

Appendix C

NAMER-WINDTEMP TAPE LISTING
(As of 4 October 1982)

This is a listing of NAMER-WINDTEMP Tapes in the USAFETAC Tape Library, the tape identification, and the time period it spans. There is an on-going project to update this data base.

TAPE	TAPE ID	TIME PERIOD
1	WINDTEMP1	January-March 1975
2	WINDTEMP2	April-June 1975
3	WINDTEMP3	July-December 1975
4	WINDTEMP4	January-June 1976
5	WINDTEMP5	July-December 1976
6	WINDTEMP6	January-March 1977
7	WINDTEMP7	April-June 1977
8	WINDTEMP8	July-September 1977
9	WINDTEMP9	October-December 1977
10	WINDTEMP10	January-March 1978
11	WINDTEMP11	April-June 1978
12	WINDTEMP12	July-September
13	WINDTEMP13	October-December 1978
14	WINDTEMP14	January-June 1979
15	WINDTEMP15	July-September 1979
16	WINDTEMP16	October-December 1979
17	WINDTEMP17	January-March 1980
18	WINDTEMP18	April-June 1980
19	WINDTEMP19	July-September 1980
20	WINDTEMP20	January-March 1981
21	WINDTEMP21	October-December 1980
22	WINDTEMP22	April-June 1981
23	WINDTEMP23	July-September 1981
24	WINDTEMP24	October-December 1981

END

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